

Dendroica tigrina. CAPE MAY WARBLER.—Mr. Link has seen seven examples of this species, some of which were taken in the Pittsburgh City limits. I examined two specimens in his collection taken there. "A specimen taken in Allegheny Co., Aug. 28, 1896." *Atkinson*.

Dendroica cærulea. CERULEAN WARBLER.—So far from this being a very rare bird, as in eastern Pennsylvania, it may be said to be numerous in the southwestern part of the State, where it breeds. I found it breeding in the vicinity of Pittsburgh, Beaver, and Ligonier, Westmoreland Co. It does not breed in the mountain districts of that County, however, none being seen at Laughlintown. It is a very loud and persistent songster.

Geothlypis agilis. CONNECTICUT WARBLER.—A male specimen was taken by Mr. Link, June 4, 1894. Another now in the Carnegie Museum was shot at Leetsdale, Allegheny Co., May 24, 1898, a female.

Geothlypis philadelphia. MOURNING WARBLER.—I found this bird breeding near Laughlintown; several pairs being noted on Laurel Ridge.

Geothlypis trichas. MARYLAND YELLOW-THROAT.—The great scarcity of this bird in Allegheny and Beaver Counties was a surprise to me. Only two were noted. A few were found breeding at Laughlintown.

Sylvania mitrata. HOODED WARBLER.—Two seen in May at Beaver. One singing male noted near Laughlintown in June. A specimen was taken at Leetsdale in May, 1898. They appear to be rare.

Anthus pensilvanicus. AMERICAN PIPIT.—The late spring and early August appearances of this bird in Beaver County noted by me suggest that it may be found breeding in the northwestern counties of Pennsylvania.

Thryothorus bewickii. BEWICK'S WREN.—In 1894 I discovered this bird breeding on the top of Tuscarora Mountain, Fulton County. One specimen was taken at Beaver, April 27, 1898. Two were recorded by me near Round Island, May 27, 1896.

Cistothorus stellaris. SHORT-BILLED MARSH WREN.—"One captured in Allegheny Co., May 4, 1894." *Atkinson*.

AN EXAMPLE OF APTOSOCHROMATISM, AS INFLUENCED BY DIET, IN *MEGASCOPS ASIO*.

BY FRANCIS J. BIRTWELL.

IN THE following pages I shall attempt to detail an account of a very remarkable example of color change without moult or feather loss (Aptosochromatism); but unfortunately the results

are very incomplete. My intention had been to carry the investigation quite exhaustively into the departments of chemistry, physics and microscopy, feeling certain that each test and experiment would intensify the central feature of the subject, but discovering that I have acquired phthisis I am compelled to abandon all confining work and leave home for the West. My data, however, may be of assistance to some future worker, who with it, and his own, will be enabled to prove — what so many will not admit, and without full warrant — the repigmentation of a feather after it has assumed the mature condition. Under the circumstances, therefore, the incompleteness of the present paper will kindly be overlooked.

Anyone who has read Dr. Chadbourne's article (Auk, Oct., 1896, and Jan., 1897) upon this subject must have felt keen disappointment at the untimely death of the Owls upon which he was working, and it was largely to carry on the unfinished work, that I at once availed myself of the opportunity presented when some excitable Blue Jays betrayed to me the hiding place of a pair of Screech Owls, March 30, 1898.

The birds were readily taken home and introduced into a shed in which boxes were placed for sleeping and a small cedar tree for perching. The larger bird was in the extreme light gray phase of coloration, the smaller Owl being in the bright red condition. Only the gray bird lived, the other one dying twelve days later. On Dec. 30, 1898, another red bird was captured and placed with the first, but was promptly eaten, so I made no further attempts to obtain another. Both red birds were easily handled, but the marks of the bill and claws of the gray bird were present invariably upon my hands after each interview. By stroking the bird's head, however, I could cause it to close both eyes and fall into a state of apparently perfect oblivion from which the plucking of specimen feathers rarely aroused him, thus enabling me to make frequent and careful examinations of the plumage.

I endeavored to promote as natural conditions for my bird as possible — kept him in the loosely built shed at all times when the weather conditions could be as favorable for my purpose as possible, gave him a mouse or a Sparrow at frequent intervals to regulate him, and gave fresh water for drinking and bathing.

Upon certain occasions when it was difficult to obtain Sparrows or mice, I gave beef mixed with cotton wool which appeared to be perfectly acceptable. Food was given upon alternate days, usually about dusk, and an average of two ounces of food was given each time. Sometimes the bird would voluntarily fast for three and four days. For the major part of the time I conducted the feeding personally and when unable to do this had it carried on under strict orders. Each few days, cast off feathers were carefully sought for and a very limited number found, not enough for an average of three a week excepting during the moult of September, 1898, when a complete renewal ensued. By far, down feathers were shed in the greatest abundance, and the few contours found were, in the majority of cases, injured or abraded.

Thus once and for all we may dismiss any possibility of increased feather loss causing direct interference with my following remarks.

At this point it may be well to discuss briefly a few of the terms employed. A great deal of useless controversy has been expended over the comprehension of exact definitions, and it is my purpose to avoid this. Aptosochromatism and Ptosochromatism have been defined in my article on the 'Occurrence of Aptosochromatism in *Chrysotis levaillanti*' (Osprey, April, 1899), and as such will be employed here. 'Moult' is an exceedingly convenient term as defined by Dr. Chadbourne (Auk, April, 1897, p. 146) and is thus used. Ptosochromatism may be regarded as a restricted process of moulting, although the two terms are by no means synonymous. 'Color change,' unless modified by qualifying terms, refers exclusively to alterations of color or structure within the feather itself, due to vital causes within the feather organism.

From April 3 until the 12th (the birds fasting until the 3d) various kinds of food were given, the birds meanwhile becoming accustomed to their change of quarters, but after the last named date, a careful feeding of beef, lamb and chicken livers (and sometimes kidneys) was begun and maintained until May 27, 1898 — a period of 53 days. During this time about 46 ounces of liver and kidney were eaten and two or three Sparrows. As-

suming—as will later be considered—that the unnatural diet was the cause of the change which ensued, we may attribute the gain of additional color in the feathers of the gray bird, to the activity caused by 2 pounds and 14 ounces of the food during a period of 53 days.

As has been before stated, the plumage of the bird was light gray—a typical example of the extreme gray phase. At the time of the discontinuation of the liver diet the feathers of the breast were diffused with burnt sienna very prominently, which tinged the edges of the downy parts and colored the lower portions of the contour parts, while a narrow margin of the same color was present about the edges of the median stripe of black and its lateral branches. I noticed indications of the change as early as April 18, and friends commented upon the altered color of the bird, which was very noticeable from a short distance, April 26. The edges of the flight feathers were also affected and very pronouncedly the ear tufts. The back feathers will be considered later on.

My bird was next put upon a diet of raw beef and kept at it until Dec. 24, 1898—a period of 211 days, during which the bird moulted completely once and consumed approximately 10 Sparrows and mice, and 190 ounces of beef. The first indications of the effect of the new diet were noticeable in a few weeks and in a curious manner. Gradually two dull sooty areas began to appear upon the breast and belly, these becoming confluent and diffusing over the entire under parts—more intense upon the breast. A feather from the breast while in this condition showed dull dusky bands radiating from an indistinct median stripe and upon a ground color of dirty white. A faint trace of rufous was present at the anterior end. This phase soon lightened until by the time of moult (Sept. 13, 1898) the bird was back in the light gray state as when captured. The melanistic condition might have been due to the mixing of the color producing substances of the reddish and gray conditions, forming an intermediate or transitional stage. However, the microscope could determine this. Up to this time (Sept. 13) my bird had eaten about 98 ounces of beef in a space of 109 days.

The moult lasted until November, when the gray stage was

still present, as before the increased feather loss. This condition prevailed until the effects of the liver diet begun on Dec. 25, 1898, began to be felt. For 154 days, or until May 28, 1899, this food was kept up. Then through necessity I was obliged to discontinue it as the bird, tired of its one-sided fare, fasted for three and four days together repeatedly and often only tore the food up into small pieces without eating it. By the above date, however, about 12 lbs. of liver were eaten. Feb. 22, 1899, the bird was very noticeably rufous colored from a distance, and this intensified with time, although the color never became profuse enough to cause a general resemblance to the color of the extreme typically red phase as found commonly in the wild state. Especially prominent were the rich borders of the two black spots of the upper breast, and as in the first red state—the colors of the ear tufts were markedly changed. During the latter few weeks, the change was very slow and it was very difficult to get the bird to eat. By May 28, however, he was much more strongly colored with rufous than before.

The beef was again put on and rapidly the bird assumed the dusky state and was immerging from this when, as has been before explained, I was obliged (July 22, 1899) to let it go. The bird flew off swiftly and in its wake the majority of House Sparrows of the vicinity. In this case, 55 days had elapsed since the change of diet, and 45 ounces of beef had been eaten.

In the back feathers the contrasting colors of the two diets were very plainly in evidence, the dull brownish areas of the feathers of the beef diet, being strongly shot with reddish in the feathers under the influence of liver.

Once, for a week, I tried the effects of bread soaked in blood but this food was emphatically rejected. It would have been interesting to have noted the effects caused by a fish diet, or a mixed one, and it is to be hoped that these will be carefully tried at some future time. The forced and one-sided diet appears to be the only marked departure from the ordinary mode of living which would be powerful enough to influence my Owl in such a marked degree, and I confidently believe it to be, at least, the principal cause. While these results do not for a moment attempt an explanation of the occurrence of the two phases in nature they

may supply a hint or two, but these will not be dwelt upon just here.

To conclude, we may affirm, that beyond doubt there was a marked change of color in the feathers of my Owl from gray to a reddish cast; that this was not concurrent with any pronounced feather loss (ptosochromatism); that it was undoubtedly, as seen at the present, influenced partly, if not in whole, by an unnatural diet (liver and kidney); and that in consequence it is an example of abnormal aptosochromatism.

It appeared from the macroscopic nature of the change that repigmentation was forcibly present but to my misfortune, being unable to further investigate this, I will leave it open to the judgment of my readers.

THE COLOR OF CERTAIN BIRDS, IN RELATION TO INHERITANCE.

BY I. BICKERTON WILLIAMS, F. Z. S.

THERE are two powerful tendencies whose working has, apparently, determined, to a large extent, the differences and the resemblances in the color of birds, as well as many others of their characters.

These are 'Variation,' on the one hand, tending to produce desirable and necessary changes through the action of natural selection; and 'Inheritance,' on the other, tending to preserve and hand down those forms and qualities that were useful and beneficial to former generations, and which, even now, are not injurious.

In the determination of color, sometimes one of these tendencies seems to have got the upper hand, and sometimes the other. There are certain bird groups that display so many different styles and colors, that, like modern fashions, one might imagine they had been adopted merely for the sake of variety; while, in other groups, some ancient style of plumage and color appears to have